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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/598,481	06/18/2007	Marco Wedowski	17979-046US1	5997

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EXAMINER	
WHITESELL GORDON, STEVEN H	
ART UNIT	PAPER NUMBER
2882	

NOTIFICATION DATE	DELIVERY MODE
04/25/2011	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PATDOCTC@fr.com

Office Action Summary	Application No.	Applicant(s)	
	10/598,481	WEDOWSKI ET AL.	
	Examiner	Art Unit	
	Steven H. Whitesell-Gordon	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 March 2011*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,71-76,78-80,92 and 93* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,71-76,78-80,92 and 93* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 03/31/2011 has been entered.

Priority

2. Acknowledgement is made of Applicant's submission of English language translation of the US Provisional Application No. 60/550,302 in the application 60/550,302.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. **Claim 1, 71-76, 78-80, 92 and 93 rejected under 35 U.S.C. 103(a) as being unpatentable over Yakshin et al. [WO 03/032329 in view of Takeuchi et al. [US 2003/0144819].**

For claims 1, 71, 72, Yakshin teaches a method for qualifying a reflective optical element having a free interface at which radiation is reflected, the method comprising:

measuring at various wavelengths (range shown in Fig. 23 and page 13) and/or various incidence angles of the radiation a reflectance (percent reflectance left axis shown in Fig. 23) and a photoelectron current (right axis) induced by the radiation in an area of the free interface (carbon layer surface, see Fig. 23b) resulting in: (a) a reflectance curve as a function of wavelength and/or incidence angle wherein the reflectance curve has a wavelength region of maximum reflectance and/or an incidence angle region of maximum reflectance (maximum of reflectance curve shown in Fig. 23 and described in page 26); and (b) a photoelectron current curve as a function of wavelength and/or incidence angle wherein the photoelectron current curve has a profile within the wavelength region of maximum reflectance and/or the incidence angle region of maximum reflectance (photoelectron curve shown); and

using the profile of the photoelectron curve for determining a phase shift of a standing electromagnetic wave of incident radiation with respect to the free interface (phase shift of standing wave shown in Fig. 23 at location of maximum reflective), or using the profile of the photoelectron curve for determining an intensity a standing electromagnetic wave of incident radiation with respect to the free interface (intensity shown at 0 on x axis as shown in Fig. 23b), wherein the photoelectron current curve and the reflectance curve are measured at a position on the interface (at least one position is shown in Fig. 23).

Yakshin does not teach that the measurement is made at a plurality of locations on the free interface in order to achieve spatial resolution.

Takeuchi teaches measurements are made at a plurality of locations on the free interface in order to achieve spatial resolution (see [0043], where multiple positions are measured in order to determine position dependent information).

It would have been obvious to one of ordinary skill in the art at the time the invention was made incorporate the measurements at multiple locations on a film surface as taught by Takeuchi in the measurement of reflectance and photoelectron emission as taught by Yakshin, because as taught by Takeuchi in [0007], the film quality is not necessarily uniform over the entire surface of the mirror, therefore in order to determine uniformity, measurements made at multiple locations help to determine the mirrors reflection quality and uniformity and to determine whether the mirror surface is suitable for use in an exposure apparatus.

For claim 73, Yakshin teaches determining the slope of the profile of the photoelectron current curve at the wavelength of maximum reflectance and/or the incidence angle of maximum reflectance (slope is shown in Figs. 23a).

For claim 74, Yakshin teaches determining a maximum (see Fig. 13 or Fig. 23a) or minimum (see Fig. 12 or Fig. 23a, see page 26 for minimum photoelectron current) of the profile of the photoelectron current curve within the wavelength region of maximum reflectance and/or the incidence angle region of maximum reflectance, wherein the wavelength corresponding to the maximum or minimum of the profile of the photoelectron current curve is closest to the wavelength corresponding to the maximum

of the reflectance curve (see Figs. 12, 13, and 23a, shows comparison between minimum and maximum photoelectron current to maximum reflectance).

For claim 75, Yakshin teaches the radiation is EUV radiation (~13nm).

For claims 76, Yakshin teaches the wavelength region of maximum reflectance or the incidence angle region of maximum reflectance is from -3% to 1% of the wavelength of maximum reflectance or the incidence angle of maximum reflectance (region of maximum reflectance shown in Figs. 23a).

For claim 78, Yakshin teaches a method for qualifying a reflective optical element that includes a multilayer system having a free interface at which radiation is reflected and/or a cap layer system and having a free interface at which radiation is reflected, the method comprising:

(i) measuring at various wavelengths (range shown in Fig. 23a and page 13) and/or incidence angles of the radiation a reflectance (percent reflectance left axis shown in Fig. 23a) and a photoelectron current (right axis) induced by the radiation in an area of the free interface (free interface at carbon capping layer shown in Fig. 23b) resulting in: (a) a first reflectance curve as a function of wavelength and/or incidence angle wherein the first reflectance curve has a wavelength region of maximum reflectance and/or an incidence angle region of maximum reflectance (maximum of reflectance curve shown in Fig. 23a); and (b) a first photoelectron current curve as a function of wavelength and/or incidence angle wherein the first photoelectron current

curve has a profile within the wavelength region of maximum reflectance and/or the incidence angle region of maximum reflectance (photoelectron curve shown in Fig. 23);

(ii) comparing the first reflectance curve and/or the first profile with a second reflectance curve and/or a second photoelectron current curve, wherein the second reflectance curve and/or the second photoelectron current curve (maximum reflection compared to photoelectron curve shown in Fig. 23a) is obtained by a simulation for a given thickness of the layers of the multilayer system and/or a given thickness of the layers of the cap layer system (carbon layer thickness shown in Fig. 23b), the second photoelectron current curve having a second profile; and

(iii) if the first reflectance curve and/or the first profile do not approximately coincide with the second reflectance curve and/or the second profile (see photoelectron curve profile of Fig. 23a), repeating (ii) with a different thickness of the layers of the multilayer system and/or a different thickness of the layers of the cap layer system,

wherein:

the method determines a thickness profile of the multilayer system and/or the cap layer system of the optical element (see carbon thickness in Fig. 23b); and

the photoelectron current curve and the reflectance curve are measured at a point on the interface (at least one position is shown in Fig. 23).

Yakshin does not teach that the measurement is made at a plurality of locations on the free interface in order to achieve spatial resolution.

Takeuchi teaches measurements are made at a plurality of locations on the free interface in order to achieve spatial resolution (see [0043], where multiple positions are measured in order to determine position dependent information).

It would have been obvious to one of ordinary skill in the art at the time the invention was made incorporate the measurements at multiple locations on a film surface as taught by Takeuchi in the measurement of reflectance and photoelectron emission as taught by Yakshin, because as taught by Takeuchi in [0007], the film quality is not necessarily uniform over the entire surface of the mirror, therefore in order to determine uniformity, measurements made at multiple locations help to determine the mirrors reflection quality and uniformity and to determine whether the mirror surface is suitable for use in an exposure apparatus.

For claim 79, Yakshin teaches the radiation is EUV radiation (wavelength ~13nm).

For claim 80, Yakshin teaches that in (ii) the first profile and/or the first reflectance curve are compared with reference data measured at a reflective optical element with a multilayer system and a cap layer system of known thickness instead of comparing with a second reflectance curve and/or a second photoelectron curve obtained by simulation (see Fig. 23a).

For claims 92 and 93, Yakshin teaches the free interface is a non-changing surface (maximum reflectance obtained, see Fig. 23 and page 26).

Response to Arguments

Applicant's arguments with respect to claims 1 and 78 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Malinowski et al. ["Controlling contamination in Mo/Si multilayer mirrors by Si surface-capping modifications"] teaches correlation between photoelectron cure, and reflectance with respect to the capping layer thickness.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven H. Whitesell-Gordon whose telephone number is (571) 270-3942. The examiner can normally be reached on Monday to Thursday, 9:00 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/S. H. W./
Examiner, Art Unit 2882

/Edward J Glick/
Supervisory Patent Examiner, Art Unit 2882